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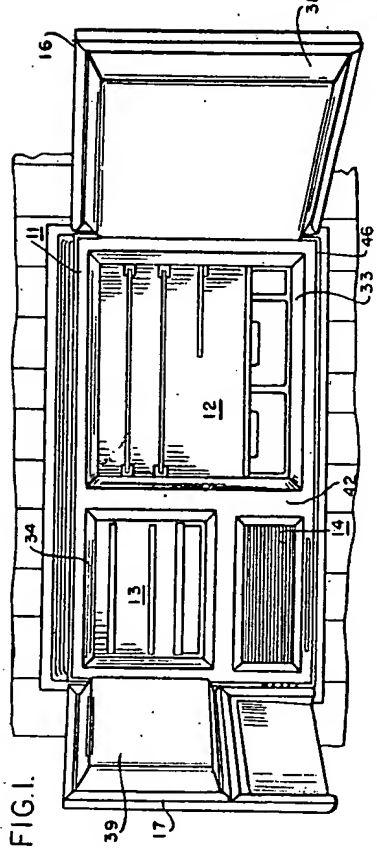

FIG.1.

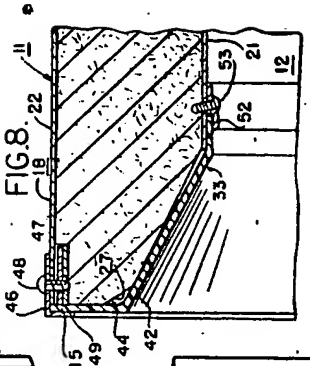

FIG.8.

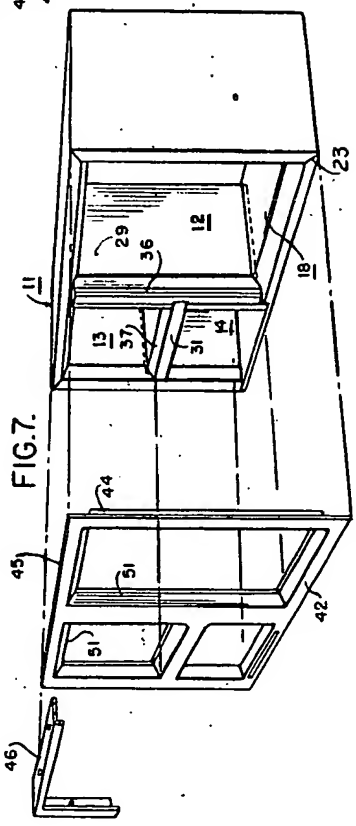

FIG.7.

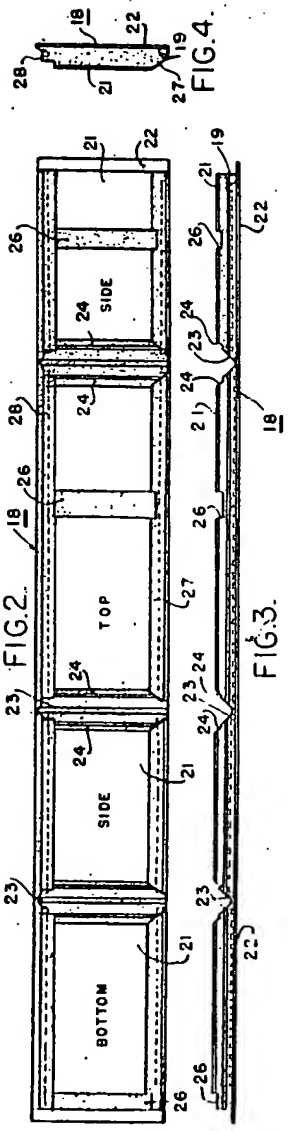

FIG.2.

FIG.3.

FIG.4.

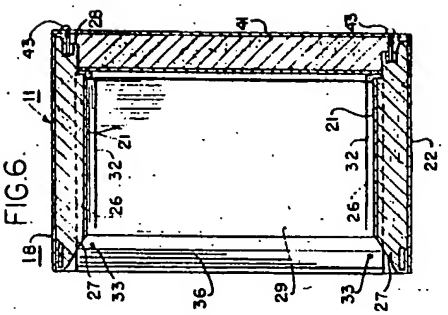

FIG.6.

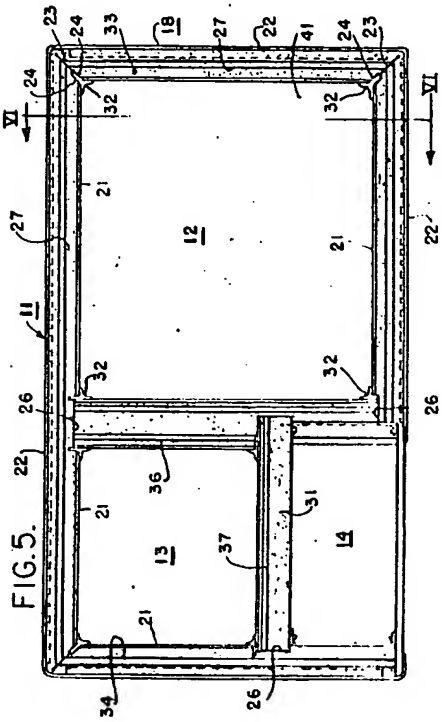

FIG.5.

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Patent No. 633,899

Refrigeration Apparatus

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Application July 31, 1958, Serial No. 755,989
In the United States August 6, 1957
5 Claims

This invention relates to refrigeration apparatus and more particularly to a novel and improved cabinet construction for domestic refrigerators or the like.

Recent developments in the synthetic materials field, notably in synthetic plastics, have made available low cost synthetic materials having good head insulating and strength qualities and which are particularly useful in the construction of refrigerator cabinets. This invention relates to the construction of refrigerator cabinets from these synthetic materials. It is the particular object or aim of the invention to provide a cabinet structure that can be readily and inexpensively fabricated and which results in a refrigerator cabinet suitable for domestic use and having performance and appearance characteristics comparable to, or better than, the more conventional refrigerator cabinets manufactured in the past.

This invention contemplates the fabrication of a refrigerator cabinet utilizing a unitary sandwich panel comprising a core of cellular plastic insulating material sandwiched between two skin members made of dense, impact resistant plastic or metallic material. In accordance with this invention, this sandwich panel is notched, or grooved, and folded to the desired configuration of the finished cabinet in such a manner that the panel forms several interconnected walls of the cabinet with one of the sandwich skin members extending over several walls of the cabinet to provide a smooth unbroken exterior surface for the cabinet.

Of particular merit is the manner envisioned by this invention of providing a finished, decorative and functional front edge for the several walls of the cabinet formed by the sandwich panel. In conventional refrigerator cabinets, the spaced front edges of the inner liner and outer shell of the cabinet are connected by a non-heat conductive strip or frame commonly called a "breaker strip", or "breaker frame". Cabinets constructed in accordance with this invention are likewise equipped with a heat breaker strip or frame that functions as a decorative cover for the edge of sandwich panel while offering a poor conductive path for the flow of heat into the interior of the cabinet. As will be explained more fully in the detailed description of the invention that follows, the breaker strip region of the refrigerator cabinet preferably has a beveled shape that can be readily and economically provided by following the teachings of this invention. This region of the cabinet is fabricated by beveling one edge of the sandwich panel before it is folded and while it is in in an easily worked, slab form. When folded, this beveled edge of the sandwich panel inherently provides the desired front edge configuration for the cabinet and, without further shaping or working, is in condition to receive a preshaped breaker frame that provides the finished surface for the edge of the panel.

The construction technique of this invention offers cost saving posibilities in refrigerator cabinet fabrication while assuring a product having a pleasing appearance and good performance.

Other advantages, features and objects of the invention will become apparent from the following detailed description thereof in which reference is made to the accompanying drawings wherein:

Fig. 1 is a front view of a built-in type, domestic refrigerator constructed in accordance with the teachings of this invention;

Figs. 2, 3 and 4 are, respectively, plan, front edge, and end views of the sandwich panel utilized in the cabinet;

Fig. 5 is a front view of a partially completed refrigerator cabinet;

Fig. 6 is a sectional view of the partially completed cabinet taken along the line VI—VI in Fig. 5;

Fig. 7 is a fragmentary, exploded view of the refrigerator cabinet shown in Fig. 1, and illustrating the breaker frame assembly step in the fabrication of the cabinet; and,

Fig. 8 is an enlarged cross sectional view of the breaker frame region of the completed cabinet.

The refrigerator chosen for purposes of illustrating this invention and shown in Fig. 1 is of the horizontal built-in variety and is intended to be mounted in a wall in such a manner that only the front portion of the cabinet (identified by the numeral 11) is visible. The interior of the cabinet 11 is conventional in that it includes a food storage compartment 12, a freezing compartment 13 and a machinery compartment 14. Access to the food storage compartment is provided by means of a door 16 hingedly mounted on the front of the cabinet 11. Access to the freezing compartment 13 is provided by another door 17 also hingedly mounted on the cabinet 11.

The cabinet 11 is adapted to be fabricated from sandwich panel material and, in accordance with this invention, the top, bottom, and side walls of the cabinet are preferably fabricated from a unitary sandwich panel 18, shown in Figs. 2, 3 and 4. The sandwich panel 18 comprises a slab, or batt, of self-supporting cellular insulating material that forms the core 19 of the sandwich and which has sheetlike skin members 21 and 22 bonded to the opposite broad faces thereof. The core 19 is preferably made from a light weight, closed cell material having good heat insulating qualities. Expanded polystyrene plastic is the preferred material from which the core 19 is made, although other cellular materials, such as foamed polyurethane, may be used as a core member. The skin members 21 and 22 can be formed from a variety of sheet materials. The inner skin member 21, so called because it becomes the inner surface, or liner walls, of the completed refrigerator cabinet, is preferably made of a moisture resistant, easily cleaned, smooth surface material such as polystyrene plastic sheet, aluminum, steel, or other materials having similar properties. The outer skin member 22, which becomes the outer surface of the refrigerator cabinet, is preferably made of a tough, impact

resistant material capable of preventing damage to the sandwich panel core 19. Glass fabric reinforced polyester plastic sheet serves admirably as an outer skin member 22, as does aluminum and steel sheet. Both skin members 21 and 22 can, if desired, be painted or otherwise treated to improve their appearances and resistance to deterioration.

The components of the sandwich panel 28 are joined to form a flat panel by bonding the skin members 21 and 22 to the faces of the core 19. Suitable adhesives are employed to join the laminations of the panel. When originally formed, the sandwich panel 18 preferably has skin members 21 and 22 which completely cover the face areas of the core 19, leaving only the edges of the core exposed. This panel 18 may then be machined by means of ordinary woodworking tools, such as saws, routers, and tenoners, to prepare the panel for the forming operations that shape it to the desired cabinet configuration.

To prepare the sandwich panel 18 for folding operations to be performed thereon to convert it into a boxlike cabinet wall structure, a plurality of transverse grooves 23 are cut therein at predetermined locations along the length of the panel. These grooves 23 permit the panel 18 to be bent, or folded, to form the corners of the refrigerator cabinet. In the cabinet 11 chosen for purposes of illustration, right angle corners are provided and the grooves 23, therefore, possess a 90° V-shape. The grooves 23, as can be seen in Fig. 3, are formed by cutting, sawing, or routing through the panel inner skin member 21 and partially through the core 19. The outer skin member 22 is left intact to form a continuous outer skin for the cabinet. If desired, the grooves 23 may be additionally relieved near their upper edges, as indicated at 24, to provide slot-like reception areas for molding or trim strips which will be described later. Similarly, transverse grooves 26 of rectangular cross section are machined in the inner face of the sandwich panel 18 to receive internal walls or partitions that serve to separate the several compartments of the completed cabinet 11.

While the sandwich panel 18 is in flat, slat-like condition, the longitudinal edges thereof are preferably shaped to the configuration required thereof in the finished cabinet. The front edge of the panel 18 is preferably beveled inwardly, in several steps, from the outer skin member 22 to the inner skin member 21 as shown at 27. The rear edge of the panel 18 is given a stepped configuration as indicated at 28. This beveling of the edges of the panel 18 is easily accomplished while the panel is still flat by using ordinary woodworking tools known as "tenoners", and both the front and rear edges can be shaped simultaneously, if desired.

The notched and shaped panel 18 is next folded at the notches 23 to form the top, side and bottom walls of the cabinet 11 as shown in Fig. 5. Suitable adhesives are preferably applied to the wall surfaces of the grooves 23 to insure a rigid corner joint after the panel 18 is folded and the side walls of the grooves 23 are brought together. Partition members are next positioned between the folded cabinet walls provided by the sandwich panel 18 to divide the interior of the cabinet 11 into the desired number of compartments. In constructing the horizontal refrigerator shown in the drawings, a vertical partition 29 is inserted into the receiving grooves 26 provided therefor in those portions of the sandwich panel 18 that form the top and bottom walls of the cabinet 11. An adhesive is employed to retain the partition 29 in place. The partition 29 is preferably constructed of a sandwich material similar to the sandwich panel 18 and serves to isolate the food storage compartment 12 of the cabinet from the freezing compartment 13 and the machinery compartment 14. Another sandwich partition 31 is inserted between the vertical partition 29 and a side wall of the cabinet 11 to serve as a divider between the freezing compartment 13 and the machinery compartment 14. The joints or junctions at the corners of the cabinet 11 and between the sandwich panel 18 and the partitions 29 and 31 are preferably covered and sealed by means of extruded plastic or metal molding or trim strips 32. At the corners of the cabinet, the moldings 32 are received in the slots provided therefor by the relieved areas 24 at the panel grooves 23 (see Figs. 3 and 4).

It will be noted that the beveled front edge 27 of the folded sandwich panel 18 defines portions of the access openings for the compartments 12 and 13. These access openings, which are identified by the numerals 33 and 34 in the drawings, taper inwardly and rearwardly with respect to the cabinet. The front edge of the partitions 29 and 31 are also beveled as indicated at 36 and 37 and cooperate with the beveled edge 27 of the sandwich panel 18 in defining the tapered access openings 33 and 34. The tapered compartment access openings 33 and 34 conform closely to the configuration of the inner face of the respective doors 16 and 17 that serve to close these openings. Stated differently, the food storage compartment door 16 has a tapered projecting region 38 on the inner face thereof that projects into the food compartment access opening 33 (see Fig. 1) when the door is closed, and the freezing compartment door 17 has a tapered inwardly projecting region 39 that extends into the freezer compartment access opening 34 when this door 17 is closed. This tapered mating of the cabinet doors with their respective access openings is a common and desirable arrangement employed in refrigerator cabinets to restrict air flow at the junction between the doors and the cabinet and thereby reduce heat leakage into the interior of the cabinet. While this general arrangement has been employed in refrigerators constructed in the past, the tapered access openings could not be provided as expeditiously in prior cabinets as is permitted by the novel cabinet construction resulting from this invention. It will be recalled that, in accordance with this invention, the beveled edge 27 of the sandwich panel 18 is shaped quickly and easily while the panel 18 is in a flat, easily worked condition. An the downwardly tapering access openings 33 and 34 inherently result from this beveling operation when the panel 18 is folded to the the desired configuration of the cabinet 11. No additional forming or shaping operations need be performed on the sandwich panel 18.

The cabinet 11 is completed by attaching, to respectively the rear and front edges of the folded panel 18, a rear wall 41 and a breaker frame 42. The rear wall 41, as shown in Fig. 6, is preferably formed of a sandwich panel similar to the panel 18 from which the top, side and bottom walls of the cabinet 11 are formed. The edges of the rear wall 41 are given a stepped configuration to mate with the stepped rear edge 28 of the folded panel 18 and the wall 41 is secured to the panel 18 by any suitable fastening means, such as the screws indicated at 43.

The breaker frame 42 provides a decorative

finished surface for the front edges of the walls of the cabinet and the partitions 29 and 31, and also serves to seal the edges of the sandwich panels from which these components are made.

The breaker frame 42 is preferably molded in one piece from plastic material in such a manner that the inner face 44 thereof (see Fig. 8) substantially conforms to the beveled edge 27 of the folded sandwich panel 18 and the beveled front edges 36 and 37 of the partitions 29 and 31. Since molding the breaker frame 42 offers considerable latitude in the design of the breaker frame so far as configuration is concerned, it is possible to provide a frame 42 that will mate with the beveled front edges of the folded panel 18 and partitions 29 and 31 even though other design considerations require that the bevel angle of the partitions differ from one another and from the bevel angle of the edge of the panel 18.

The breaker frame 42 is preferably sealed to the beveled edges of the sandwich panel 18 and partitions 29 and 31 to prevent moisture from migrating into the compartments 12 and 13. This can be accomplished by bonding the breaker frame 42 to these members by means of a suitable adhesive. The breaker frame 42 is also preferably held in place by additional fastening means such as that illustrated in Fig. 8. The outer peripheral edge 45 of the breaker frame 42 is preferably held in tight engagement with the outer skin member 22 of the sandwich panel 18 by an L-shaped, metallic trim strip 46. The trim strip 46 encompasses the front edge of the cabinet 11 and has a base portion 47 thereof secured to the sandwich panel 18 by means of screws 48. The trim strip 46 also has a bent-over portion 49 extending at right angles to the base portion 47 and overlying the outer peripheral edge 45 of the breaker frame 42 to prevent displacement of the edge of the breaker frame from the sandwich panel 18. The inner peripheral edges 51 of the breaker frame 42 are held against the inner skin member 21 and the side walls of the partitions 29 and 31 by flexible plastic trim strips 52 that are anchored in place by means of screws 53.

From the foregoing, it will be apparent this invention provides a unique and novel refrigerator cabinet construction involving only simple and inexpensive fabricating techniques and operations and thereby enables the manufacturer to produce a quality refrigerator cabinet at low cost. It should further the apparent that the invention effectively utilizes sandwich type insulating panels in a manner to take advantage of the unusual characteristics of the material. The invention further provides a front edge construction for a refrigerator cabinet which, because of the ease with which it may be fabricated, additionally contributes economies in manufacture.

While the invention has been shown in but one form, it will be obvious to those skilled in the art that it is not so limited but is susceptible of various other changes and modifications without departing from the spirit thereof.

The embodiments of the invention in which an exclusive property or privilege is claimed are defined as follows:

1. A corner construction for a refrigerator cabinet and comprising a unitary sandwich panel forming two adjoining walls of the cabinet that are disposed at right angles to one another, said sandwich panel comprising a core member of heat insulating material, said core having inner and outer faces, an inner skin member bonded to the inner face of said core member and an outer skin member bonded to the outer face of said core member, said inner skin member and at least a portion of said core member being notched to permit folding of said sandwich panel to form the junction of said cabinet walls whereby the outer skin member of said panel forms a continuous outer surface for both of said walls, said sandwich panel having one edge thereof beveled prior to folding and providing intersecting edge portions of said walls that are obliquely disposed with respect to a plane that is normal to the outer surfaces of both of said walls, and a unitary breaker member having face portions shaped to conform to the said edge portions of both of said walls and having marginal edge portions that are disposed adjacent respectively the inner and outer skin members of said sandwich panel.

2. A corner construction for a refrigerator cabinet and comprising a unitary sandwich panel forming two adjoining walls of the cabinet that are disposed at right angles to one another, said sandwich panel comprising a core member of heat insulating material, said core having inner and outer faces, an inner skin member bonded to the inner face of said core member and an outer skin member bonded to the outer face of said core member, said inner skin member and at least a portion of said core member being notched to permit folding of said sandwich panel to form the junction of said cabinet walls whereby the outer skin member of said panel forms a continuous outer surface for both of said walls, said sandwich panel having one edge thereof beveled prior to folding and providing intersecting edge portions of said walls that are obliquely disposed with respect to a plane that is normal to the outer surfaces of both of said walls, and a unitary breaker member having face portions shaped to conform to the said edge portions of both of said walls and having marginal edge portions that are disposed adjacent respectively the inner and outer skin members of said sandwich panel, and means for retaining said breaker member in engagement with the said edge of said sandwich panel, said means including a metallic strip secured to the outer surface of said outer skin adjacent the said edge of the sandwich panel, said strip having one edge bent to overlie and engage the marginal edge of said member that is adjacent said outer skin member.

3. In a refrigerator cabinet, a unitary sandwich panel forming two substantially parallel space walls and a connecting wall said cabinet, said sandwich panel comprising a heat insulating core member having inner and outer faces, an inner skin member bonded to the inner face of said core member, and an outer skin member bonded to the outer face of said core member, said sandwich panel having grooves in one face thereof extending through the said inner skin member and at least partially through the said core member to permit said sandwich panel to be folded at said grooves to form the corner junctions between the connecting wall and the two spaced walls of the cabinet, the construction and arrangement being such that the outer skin member of said sandwich panel extends continuously over the outer face of all of the said cabinet walls, said sandwich panel being beveled along one edge thereof prior to folding and providing intersecting edge portions of said walls to define an inwardly tapering access opening for said cabinet, and a unitary breaker frame covering the said edge of said sandwich panel, said breaker frame having a face thereof shaped to substantially conform to the said

beveled edge of said sandwich panel after folding and having inner and outer marginal edges disposed to engage respectively the inner and outer skin members of said sandwich panel.

4. In a front opening refrigerator cabinet, a unitary sandwich panel forming top and side walls of said cabinet, said sandwich panel comprising a slab-like core member of heat insulating material and sheet skin members bonded to the faces of said core member and forming inner and outer surfaces for said cabinet walls, said sandwich panel having generally V-shaped grooves in one face thereof and extending into said core member, said sandwich panel being folded at said grooves to form corner regions of said cabinet with one of the skin members of said panel forming a continuous outer surface for the side and top walls of said cabinet, said sandwich panel being beveled prior to folding along the one edge thereof forming the front edge of said cabinet whereby the front edges of each of the top and side walls of said cabinet are disposed at an angle with respect to the plane of the front of the cabinet and define at least in part an inwardly and rearwardly tapering access opening for the cabinet, and a unitary breaker frame covering the front edges of said cabinet walls, said breaker frame having a rear face conforming substantially to the beveled edge of said sandwich panel after folding and having inner and outer marginal edges disposed to respectively engage the skin members of said panel.

5. In a refrigerator cabinet, a unitary sandwich panel forming two substantially parallel spaced walls and a connecting wall of said cabinet, said sandwich panel comprising a heat insulating core member having inner and outer faces, an inner skin member bonded to the inner face of said core member, and an outer skin member bonded to the outer face of said core member, said sandwich panel having grooves in one face thereof extending through the said inner skin member and at least partially through the said core member to permit said sandwich panel to be folded at said grooves to form the corner junctions between the connecting wall and the two spaced walls of the cabinet, the construction and arrangement being such that the outer skin member of said sandwich panel extends continuously over the outer face of all of the said cabinet walls, said sandwich panel being beveled along one edge thereof prior to folding whereby the edges of said cabinet walls formed by said panel edge partially define an inwardly tapering access opening for said cabinet, a partition extending between said parallel walls of the cabinet and being disposed substantially parallel to said connecting wall of the cabinet, said partition comprising a slab of insulating material and a skin member bonded to the face of said slab that faces the said connecting wall of the cabinet, said partition having an edge thereof that cooperates with said panel edge in defining said access opening, said partition edge being beveled inwardly of the cabinet, and a unitary breaker frame covering the said edges of said partition and said sandwich panel, said breaker frame having the face of one leg thereof shaped to substantially conform to the beveled edge of said partition and face portions of the remaining legs thereof shaped to conform to the beveled beveled edge of said sandwich panel.

ROGER DUHAMEL, F.R.S.C., Queen's Printer and Controller of Stationery, Ottawa, 1961